

WASHINGTON DEPARTMENT OF ECOLOGY
ENVIRONMENTAL ASSESSMENT PROGRAM
FRESHWATER MONITORING UNIT
STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 19C060
STATION NAME: West Twin River
WATER YEAR: 2009
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Introduction

Watershed Description

The West Twin River station is a stand-alone, continuously recording gaging station that has been operating since June 2004 in Water Resource Inventory Area (WRIA) 19. Like the other two drainages within the Strait of Juan de Fuca complex (East Twin River and Deep Creek) , West Twin River is very dynamic and carries substantial loads of bed material and large woody debris during precipitation--driven storm events which typically occur from November through February. The basin geology is composed of Crescent Formation volcanic rock in the upper watershed, marine sedimentary rock in the lower watershed, and terraces of glacial deposits in the lower floodplain (ONF 2002).

Gage Location

The gaging station is located in Clallam County, Washington approximately 20 miles west of Port Angeles. The station is on the left bank approximately 0.2 miles upstream from the mouth.

Table 1. Basin Area and Legal Description

Drainage Area (square miles)	12.7
Latitude (degrees, minutes, seconds)	48 09 47
Longitude (degrees, minutes, seconds)	123 57 10

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	30
Median Annual Discharge (cfs)	23
Maximum Daily Mean Discharge (cfs)	256
Minimum Daily Mean Discharge (cfs)	2.0
Maximum Instantaneous Discharge (cfs)	340
Minimum Instantaneous Discharge (cfs)	1.8
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	69
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	3.5
Number of Days Discharge is Greater Than Range of Ratings	6
Number of Days Discharge is Less Than Range of Ratings	0
Number of Un-Reported Days	6
Number of Days Qualified as Estimates	59
Number of Modeled Days	0

Note: Statistics displayed in Table 2 may not include values in which the predicted discharge exceeds the range of ratings.

Table 2 Discussion (Discharge Statistics)

Six total days were not factored into the discharge statistics reported in Table 2. These six days were some of the highest discharge values recorded during the water year, so actual values were higher than those reported in the table. An unusually high number of days were quality coded estimated due to exceedances of the logger drift error thresholds. WY 2009 was marked by a very large hydrologic event in early January 2009. This event altered channel geometry at West Twin River and many other streams and rivers. A brief series of small events followed the January flood until the seasonal decline to baseflow began in June 2009. Once again, a precipitation event in early September 2009 mitigated summer low-flow conditions.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	12.4
Potential Weighted Rating Error (% of discharge)	8.1
Total Potential Error (% of discharge)	20.5

Table 3 Discussion (Error Analysis)

Total Potential Error (TPE) is the cumulative value of the potential logger drift error and the potential weighed rating error. Error surrounding any predicted discharge value is acquired in a number of ways ranging from variability in the quality of any particular discrete discharge measurmeent to the operational performance of a datalogger and the sonde measuring stage. Total Potential Error defines the expected range for any predicted discharge value. For example, if the TPE is 10.0 % and the predicted discharge value is 100 cfs, the range in which the actual predicted value lies is 90 to 110 cfs. For 146 of the recorded days, the agreement between the stage on the logger and discrete observations of the primary gage index met standards defining stable drift. Fifty nine days were quality coded as estimated due to logger drift error exceedances.

Table 4. Stage Record Summary

Minimum Recorded Stage (feet)	2.11
Maximum Recorded Stage (feet)	7.13
Range of Recorded Stage (feet)	5.02

Table 4 Discussion (Stage Record)

A series of data gaps during the summer months due to intermittent equipment failures that were difficult to diagnose, were filled using regressed, very well correlated stage data from a nearby gaging station. During all of WY2009, discrepancies between the observed value of the primary gage index and the logged stage value were reconciled by automated adjustment of the stage record using the data shift function. The maximum stage value was recorded on January 7, 2009. The minimum stage value was recorded on October 1, 2008.

Table 5. Rating Table Summary

Rating Table No.	7	8	9
Period of Ratings	10/01-11/11	11/06-01/10	01/07-09/30
Range of Ratings (cfs)	1.8-338	20-381	0.001-381
No. of Defining Measurements	7	2	12
Rating Error (%)	7.2	5.5	8.9

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

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Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Table 5 Discussion (Rating Tables)

Three ratings were required to predict discharge for the water year. A moderately large event in November 2008 resulted in filling of the hydraulic control, warranting a shift from rating Table 7 to rating Table 8. The much larger event in November 2009 further filled the hydraulic control, prompting the creation of rating Table 9. Table 9, coupled to the continuous stage record, predicted discharge for the remainder of WY2009.

Table 6. Model Summary

Model Type (Slope conveyance, other, none)	none
Range of Modeled Stage (feet)	
Range of Modeled Discharge (cfs)	
Valid Period for Model	
Model Confidence	

Table 6 Discussion (Modeled Data)

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Table 7. Survey Type and Date (station, cross section, longitudinal)

Type	Date

Table 7 Discussion (Surveys)

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Activities Completed

MS5 Hydrolab installed on 09/30/2009 for continuous water quality monitoring.
